REMARKS

The present Amendment amends claims 1-11, 14 and 19 and leaves claims 12 and 13 unchanged. Therefore, the present application has pending claims 1-14 and 19.

Claims 1, 2 6, 9, 10, 12 and 13 stand objected to due to informalities noted by the Examiner in paragraph 3 of the Office Action. Amendments were made to claims 1, 2 6, 9, 10, 12 and 13 to correct the informalities noted by the Examiner. Therefore, this objection is overcome and should be withdrawn.

Claims 1, 3, 4, 8, 9, 11-13 and 19 stand rejected under 35 USC §102(e) as being anticipated by Arimilli (U.S. Patent Application Publication No. 2003/0009640); and claims 2, 5-7 and 14 stand rejected under 35 USC §103(a) as being unpatentable over Arimilli in view of Benantar (U.S. Patent Application Publication No. 2002/0144119); and claim 10 stand rejected under 35 USC §103(a) as being unpatentable over Arimilli in view of Matsumoto (U.S. Patent No. 5,737,522). These rejections are traversed for the following reasons. Applicants submit that the features of the present invention as now more clearly recited in claims 1-14 and 19 are not taught or suggested by Arimilli, Benantar or Matsumoto whether taken individually or in combination with each other as suggested by the Examiner. Therefore, Applicants respectfully request the Examiner to reconsider and withdraw these rejections.

Amendments were made to claims 1-14 and 19 to more clearly recite that the present invention is directed to a cache control method in a computer system including a storage device, a relay device and a plurality of clients, the

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relay device, the storage device and a computer program executable by the relay device.

According to the present invention the cache control method is operable in a computer system that includes a storage device having a plurality of physical devices for storing data, wherein a plurality of virtual volumes are formed on the physical devices, at least one client to which at least one of the virtual volumes is assigned, a relay device which relays data between said storage device and the at least one client, said relay device including a cache disk module for caching data being transferred between the storage device and the at least one client, and a network for connecting the storage device, the at least one client and the node device to each other.

Further, according to the present invention the cache control method controls the cache in the disk device by relating data processed in the computer system with attribute data which configures a caching operation of the cache disk module that caches the processed data on the network, and mediating the processed data between the storage device and the client device via the network without the caching operation of the cache disk module when the attribute data prohibits the caching operation.

Still further according to the present invention the attribute data is held in a cache attribute management table which stores a plurality of entries each of which sets a corresponding relation between identification information identifying one of the virtual volumes, identification information identifying one of the physical devices and an indication whether data stored in the one of said physical devices is cacheable or not.

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The above described features of the present invention as now more clearly recited in the claims are not taught or suggested by any of the references of record, particularly Arimilli, Benantar or Matsumoto whether taken individually or in combination with each other or any of the other references of record.

Arimilli teaches a non-uniform memory access (NUMA) data processing system having a plurality of nodes coupled to a node interconnect, said nodes containing a plurality of processing units and at least one system memory having a table (e.g., a page table) resident therein. As per Arimilli the table includes at least one entry for translating a group of non-physical addresses to physical addresses that individually specifies control information pertaining to the group of non-physical addresses for each of the plurality of nodes and the control information may include one or more data storage control fields, which may include a plurality of write through indicators that are each associated with a respective one of the plurality of nodes.

Arimilli teaches that when a write through indicator is set, processing units in the associated node write modified data back to system memory in a home node rather than caching the data. The control information may further include a data storage control field comprising a plurality of non-cacheable indicators that are each associated with a respective one of the plurality of nodes. In Arimilli when a non-cacheable indicator is set, processing units in the associated node are instructed to not cache data associated with non-physical addresses within the group translated by reference to the table entry. The control information may also include coherency control information that

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individually indicates for each node whether or not inter-node coherency for data associated with the table entry will be maintained with software support.

The above described teachings of Arimilli do not in anyway correspond to the features of the present invention as recited in the claims.

Particularly the present invention as recited in the claims provides a structure that provides a computer system that includes a storage device having a plurality of physical devices for storing data, wherein a plurality of virtual volumes are formed on the physical devices, at least one client to which at least one of the virtual volumes is assigned, a node device including a cache disk module for caching data being transferred between the storage device and the at least one client, and a network for connecting the storage device, the at least one client and the node device to each other. Such a structure is clearly not taught or suggested by Arimilli. In Arimilli there is no teaching or suggestion that the nodes 12 are connected between a client and a storage device as in the present invention as recited in the claims.

Further, the present invention as recited in the claims provides that the attribute data is held in a cache attribute management table which stores a plurality of entries each of which sets a corresponding relation between identification information identifying one of the virtual volumes, identification information identifying one of the physical devices and an indication whether data stored in the one of said physical devices is cacheable or not. There is no teaching or suggestion in Arimilli of a cache attribute management table as recited in the claims.

In Arimilli the page table 19 simply describes that each PTE 82 includes a valid bit 90 indicating whether the PTE entry 82 is valid, a Virtual

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Segment ID (VSID) 92 specifying the high-order bits of a virtual page number,

a hash function identifier (H) 94 indicating which of the primary and secondary

hash functions was utilized to create the PTE 82, an Abbreviated Page Index

(API) 96 specifying the low order bits of the virtual page number, a Physical

Page Number (PPN) 98 identifying the corresponding physical memory page

frame, referenced (R) bit 100 and changed (C) bit 102 indicating whether the

memory page has been accessed or modified since these bits have been

reset, memory access attribute (WIMG) bits 104 specifying memory update

modes for the memory page, and page protection (PP) bits 106 defining

access protection constraints for the memory page.

In addition, in Arimilli the page table 19 further describes that each PTE

82 further includes three new node-specific fields introduced by the present

invention: Node Write Through (NWT) field 108, Node No-Intent-to-Cache

(NNC) field 110, and Node Local Read-with-Intent-to-Modify (NLM) field 112.

At no point is there any teaching or suggestion in Arimilli of the above

described features of the present invention particularly regarding the setting of

a corresponding relation between identification information identifying one of

the virtual volumes, identification information identifying one of the physical

devices and an indication whether data stored in the one of said physical

devices is cacheable or not in a cache attribute management table.

In Arimilli, a network switch 15 relays data among a plurality of nodes

12. Arimilli discloses data caching control in each of the plurality of nodes 12.

Arimilli, however does not teach or suggest the data caching control in the

network switch 15 as in the present invention.

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Further, PTE 82 in Arimilli is the data that CPU 20 refers to and is not the data that is transmitted to the network switch 15 as in the present invention. Thus, the network switch 15 of Arimilli is incapable of carrying out data caching control with PTE 82 as in the present invention as recited in the claims.

Accordingly, Arimilli fails to teach or suggest that the apparatus taught therein carries out data caching control in the relay device as in the present invention.

Thus, Arimilli fails to teach or suggest a computer system that includes a storage device having a plurality of physical devices for storing data, wherein a plurality of virtual volumes are formed on the physical devices, at least one client to which at least one of the virtual volumes is assigned, a node device including a cache disk module for caching data being transferred between the storage device and the at least one client, and a network for connecting the storage device, the at least one client and the node device to each other as recited in the claims.

Further, Arimilli fails to teach or suggest that the attribute data is held in a cache attribute management table which stores a plurality of entries each of which sets a corresponding relation between identification information identifying one of the virtual volumes, identification information identifying one of the physical devices and an indication whether data stored in the one of said physical devices is cacheable or not as recited in the claims.

Therefore, Arimilli fails to teach or suggest the features of the present invention recited in claims 1, 3, 4, 8, 9, 11-13 and 19. Accordingly,

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reconsideration and withdrawal of the 35 USC §102(e) rejection of claims 1, 3, 4, 8, 9, 11-13 and 19 as being anticipated by Arimilli is respectfully requested.

The above noted deficiencies of Arimilli are not supplied by any of the other references of record. Particularly, the above described deficiencies of the Arimilli are not supplied by Benantar or Matsumoto. Therefore, combining the teachings of Arimilli, Benantar and Matsumoto in the manner suggested by the Examiner in the Office Action still fails to teach or suggest the features of the present invention as now more clearly recited in the claims.

Benantar is merely relied on by the Examiner for an alleged teaching of authentication processing via data encryption. Benantar's invention is directed to encrypting that enables authentication data to be exchanged among a plurality of clients. Benantar's invention is not intended to encrypt data to be stored in a relay device among clients as in the present invention as recited in the claims.

Matsumoto is merely relied on by the Examiner for an alleged teaching of notifying the occurrence of an error. Matsumoto's invention is directed to the re-sending of data when a transmission error occurs. Matsumoto provides no disclosure of a relay device that relays data among devices as in the present invention. Further, Matsumoto fails to teach or suggest the caching of data in the process of being relayed among devices as in the present invention as recited in the claims.

At no point is there any teaching or suggestion in Benantar or Matsumoto of the above described features of the present invention as recited in the claims shown above to be not taught or suggested by Arimilli.

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Thus, the combination of Arimilli with one or more of Benantar and Matsumoto still fails to teach or suggest the features of the present invention as now more clearly recited in the claims. Therefore, the combination of Arimilli with one or more of Benantar and Matsumoto does not render obvious the features of the present invention as recited in the claims. Accordingly, reconsideration and withdrawal of the 35 USC §103(a) rejection of claims 2, 5-7 and 14 as being unpatentable over Arimilli in view of Benantar and the 35 USC §103(a) rejection of claim 10 as being unpatentable over Arimilli in view of Matsumoto is respectfully requested.

The remaining references of record have been studied. Applicants submit that they do not supply any of the deficiencies noted above with respect to the references utilized in the rejection of claims 1-14 and 19.

In view of the foregoing amendments and remarks, applicants submit that claims 1-14 and 19 are in condition for allowance. Accordingly, early allowance of claims 1-14 and 19 is respectfully requested.

To the extent necessary, the applicants petition for an extension of time under 37 CFR 1.136. Please charge any shortage in fees due in connection with the filing of this paper, including extension of time fees, or credit any overpayment of fees, to the deposit account of MATTINGLY, STANGER, MALUR & BRUNDIDGE, P.C., Deposit Account No. 50-1417 (1288.43131X00).

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